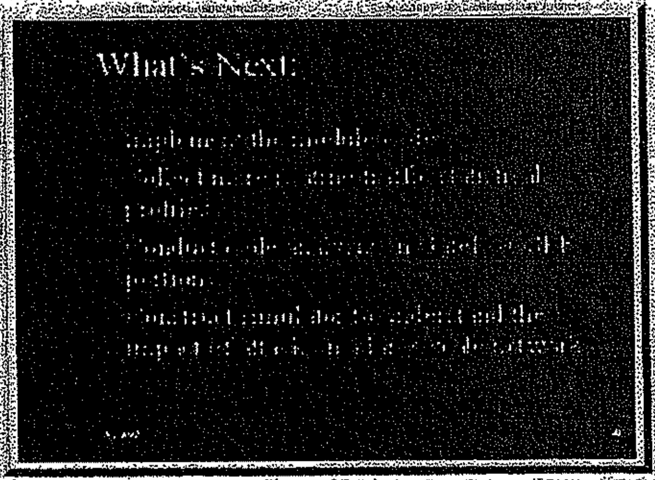

What's Next:

- Implement the modules [illegible]
- Collect more [illegible] statistical profiles
- Conduct [illegible] positions
- Construct [illegible] and the impact of [illegible]

Scalable Intrusion Detection for the Emerging Network Infrastructure

Scalable Intrusion Detection for the Emerging Network Infrastructure

Y. Frank Jou S. Felix Wu

MCNC NCSU

IDS Program Review

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Project Update

Project Update

- Overview
- System Architecture Design
- Routing Testbed Configuration
- Routing Traffic Statistical Profiles
- Routing Attacks
- What's next ...

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PP Presentation

Overview: Target Environment

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PP Presentation

Overview: JiNao Architecture

- Integration of attack prevention (configurable firewall) and intrusion detection.
- Detect your neighbors.
- A RSMM (Remote Security Management Module) can coordinate a set of JiNao's to detect orchestrated attacks and isolate bad routers.

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System Design: ♂ Block Diagram

System Design: ♂ Block Diagram

Prevention Module

Detection Module

Decision Module

RSMM

SNMPv3 Eng.

Security

Officer

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System Design: Intercept. Mod.

System Design: Intercept. Mod.

- May be placed in multiple protocol layers
  - Device driver
  - IP/IPSEC
  - Higher-layer protocols
- May facilitate active intrusion detection
  - Catch-and-Trap (through RSMM)
- May timestamp the packet

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PP Presentation

System Design: Prevention Mod.

- Prevention Layer: Go or No-Go
  - Quick response
- Extraction Layer
  - PDU format conversion
  - Multiple interception points correlation
    - e.g. This SNMPng/v3 PDU is from /dev/eth1 and /dev/tunnel

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PP Presentation

System Design: Protocol Analysis

- Maintain a set of Finite-State Machines
  - One FSM for each identified intrusion
- Provide extensibility
  - Reconfigurable at Run-Time
    - Table-driven implementation of FSMs
    - With a generic driver routine
  - Use Concurrency Workbench (CWB) to produce the FSMs

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PP Presentation

System Design: Statistical Analysis

- Unknown vulnerability detection
  - Complementary to rule-based and protocol-based analysis
- Profile training
  - Comparing short-term vs. long-term behaviors
    - Weighted aging: Favor more recent observation
  - Experimenting with NIDES statistical algorithm

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PP Presentation

System Design: Decision Mod.

- Make decisions on intrusion based on input from Prev/Detec Modules and RSMM
- Provide information for the IAM (RSMM)
- Propagate global information to the Prev/Detec Modules
- Notify security officer of faults/intrusion

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PP Presentation

Router A

Router B

Correlate Input to make informed decision

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PP Presentation

System Design: Info. Abst. Mod.

- Detection Info. aggregation/MIB-fication
    - Run-length coding for data reduction for repeated normal report or persistent fault
- Periodic checking and propagation of global information
- Scope of Impact representation
    - Topological info. on all the affected routers through graph representation (GrIDS?)

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PP Presentation

System Design: MIB

- Rule/FSM configuration and statistical parameter specification
- Local detection results
- Detection notifications
- Security control
- Log access

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PP Presentation

System Design: RSMM

- SNMPv3-based management applications
- Access JiNao MIBs and correlate detection results
- Example: active intrusion detection (Catch and Trap)

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PP Presentation

Alice

Bob

Chris

RSMM

Active Intrusion Detection: Catch &

Trap

(1)

(2)

(3)

(4)

(5)

(6)

trap

(7)

(0)

suspend

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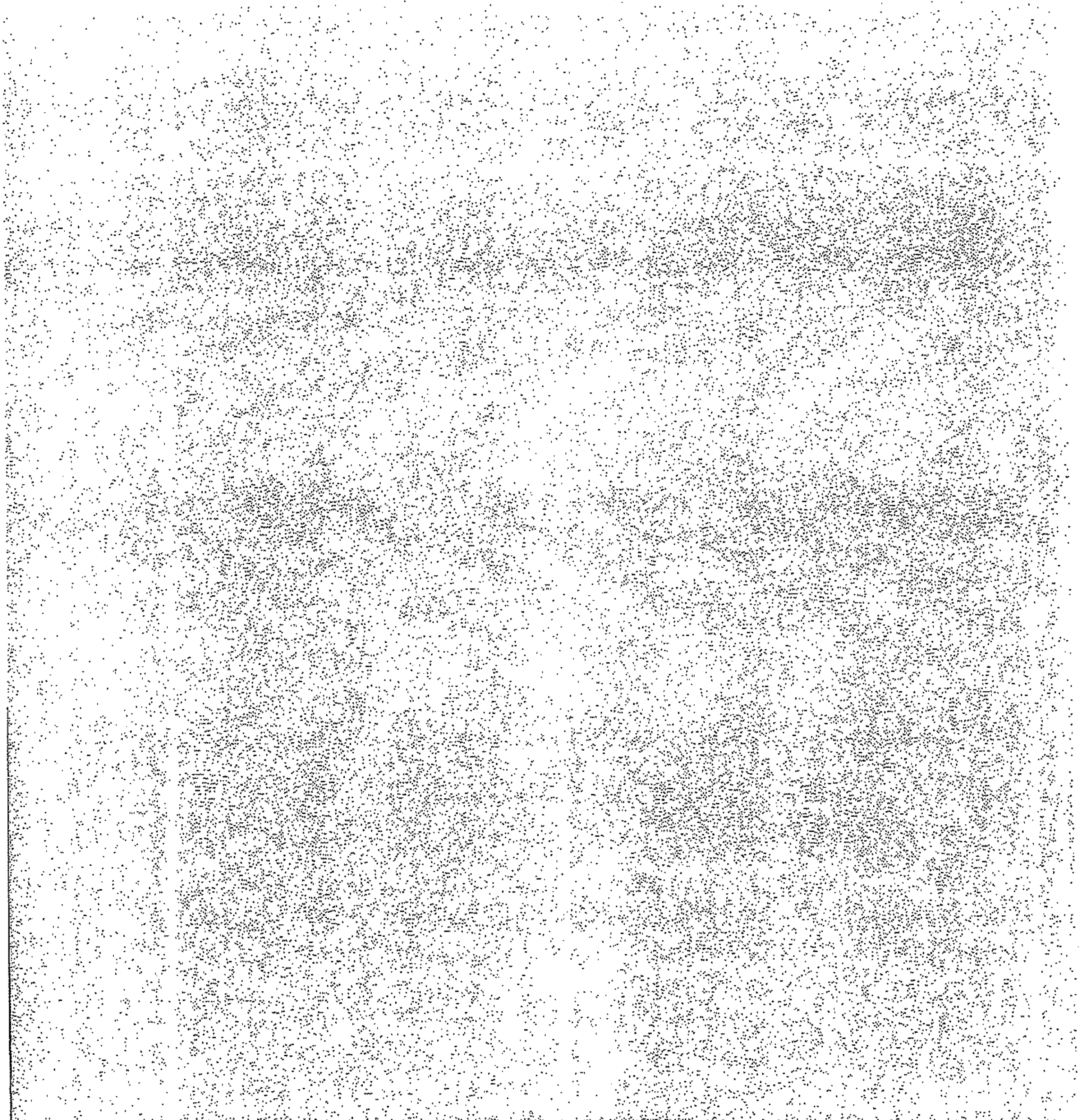

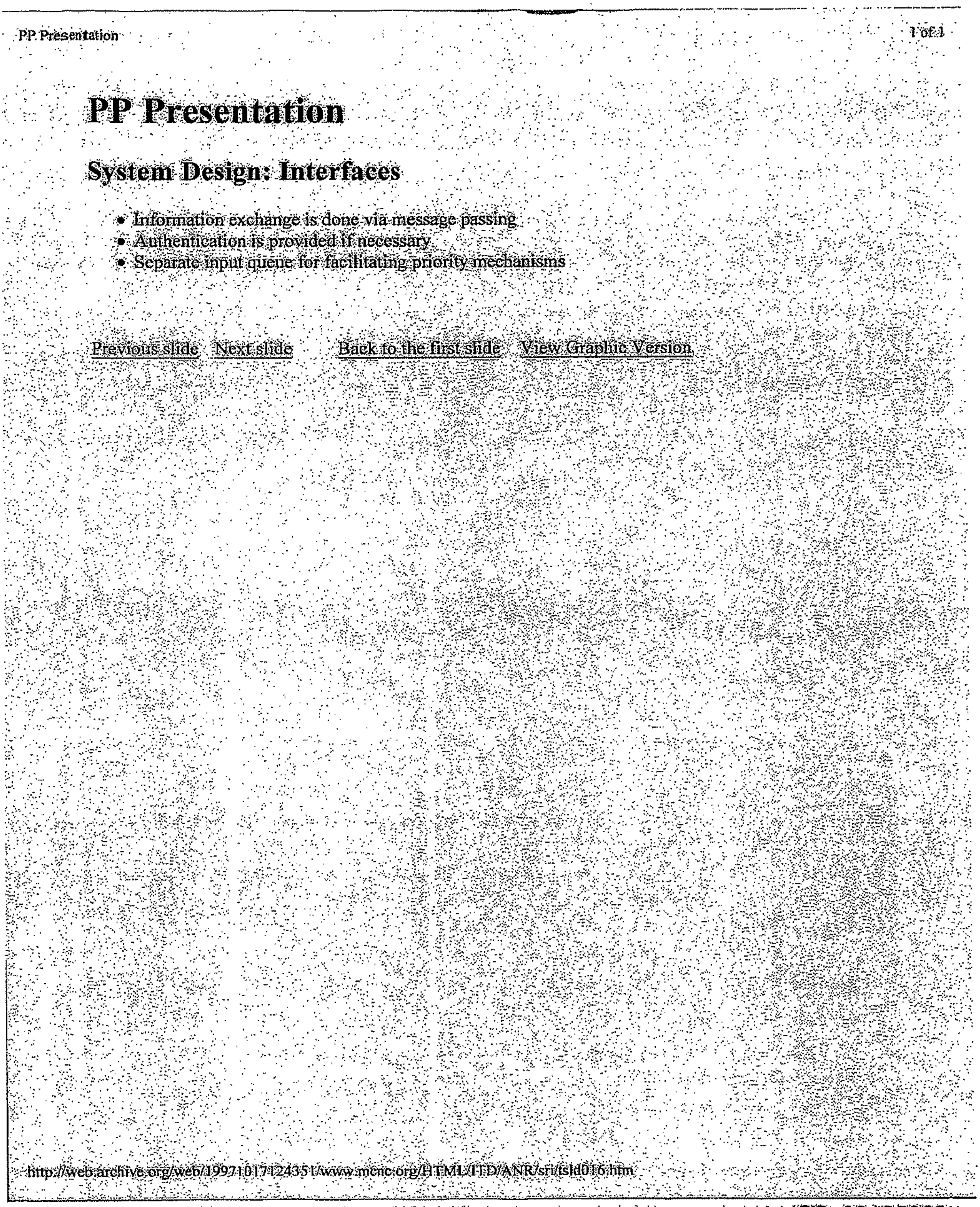

PP Presentation

System Design: Interfaces

- Information exchange is done via message passing
- Authentication is provided if necessary
- Separate input queue for facilitating priority mechanisms

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PP Presentation

Testbed Configuration

- Two routing testbeds (autonomous systems, AS): MCNC & NCSU
- Each has three to four areas
- Allow independent code development
- Will be linked together to experiment ASBR attacks (only AS-external-LSAs are flooded throughout the entire AS)
- (Ref: configuration in file "testbed.ps")

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PP Presentation

Routing Statistical Profiles

- Hello packets: stable (like step-function)
- Database Description and LS Request packets: rare events (only for forming adjacencies)
- LS Update and LS Ack: periodic in about every 30 min (LSRefreshTime: 30 min; MinLSInterval: 5 sec)
- (Look for four other postscript files, two were normal, two were under attack)

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